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(54) Centrifugal pump

(57) A centrifugal pump comprising an impeller (1) provided with a first blading (2) suitable for sucking liquids from at least one inlet conduit (4) and pumping them towards a manifold (5) arranged around the impeller (1), the blades of this first blading (2) being oriented for pumping according to a rotation direction (3) of the impeller (1), which is mechanically linked to a shaft (7) which can be driven by a motor (8) and is provided with a second blading (15) oriented in the direction opposite to the direction of the first blading (2) and is linked to the shaft (7) by means of a screw mechanism (9, 11, 12) so that the rotation of shaft (7) in one direction (3) or in the other one (21) causes the axial advancing or moving back, respectively, of the impeller (1) in a housing (13) obtained in the body of the pump and the consequent arrangement of the blading (2, 15) suitable for pumping according to the rotation direction (3, 21) of the shaft (7) close to at least one first opening (17) or at least one second opening (18) which connect the housing (13) of the impeller (1) to the manifold (5).

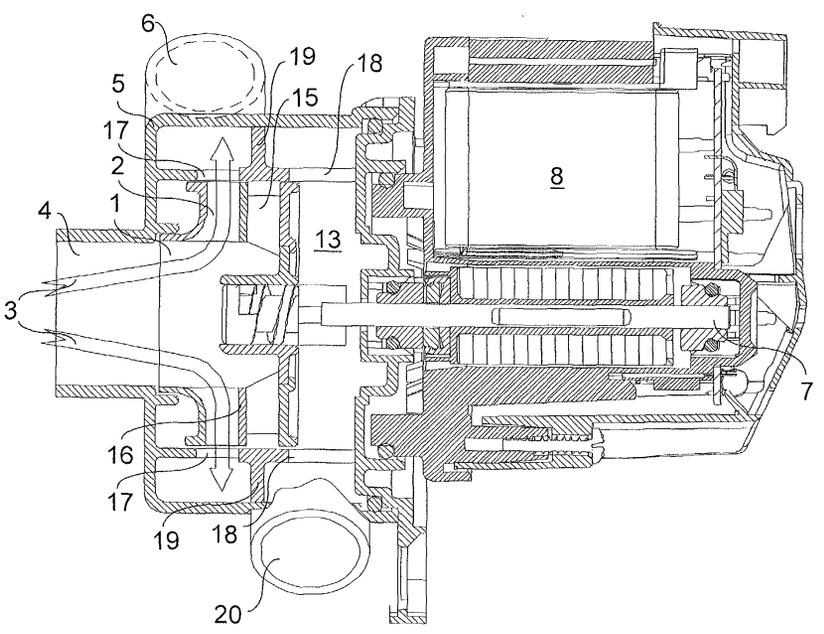

Fig.1

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Description

[0001] The present invention relates to a centrifugal pump, and in particular to a pump which can pump liquids in two different delivery conduits according to the rotation direction of the impeller.

[0002] The known centrifugal pumps, in particular those for electric household appliances, can be driven by electric motors to pump water in a delivery conduit linked to the washing circuit. Some dishwashers have two separate circuits for upper and lower sprayers, so they require a valve arranged downstream the centrifugal pump to alternately deviate the water flow coming from the delivery conduit to these sprayers, with consequent increase of the complexity and of the costs of the dishwasher.

[0003] The object of the present invention is therefore to provide means for avoiding the above-mentioned drawback, that is means which allow to eliminate the valve for deviating the water flow to two separate circuits. Said object is achieved with a pump whose main features are specified in the first claim and other features are specified in the following claims.

[0004] By virtue of the double blading of the impeller and of the screw mechanism which moves the impeller according to the rotation direction thereof, the pump according to the present invention automatically selects the blading suitable for the liquid pumping and arranges it close to one of the two openings obtained in the impeller. Since both these openings are connected to a delivery conduit, it is possible to select the circuit in which water is pumped simply by controlling the rotation direction of the impeller, that is of the motor which drives the pump.

[0005] Further advantages and features of the pump according to the present invention will be clear to those skilled in the art from the following detailed and non-limiting description of one embodiment thereof with reference to the attached drawings wherein:

- figure 1 shows a longitudinal sectional view of the pump according to this embodiment of the invention in a rotation direction;
- figure 2 shows a front view of the pump of figure 1;
- figure 3 shows an enlargement of the pump of figure 1;
- figure 4 shows a longitudinal sectional view of the pump of figure 1 in the opposite rotation direction; and
- figure 5 shows a front view of the pump of figure 1 in the opposite rotation direction.

[0006] Referring to figure 1, it is visible that the centrifugal pump according to the present invention comprises in a known way an impeller 1 provided with a first blading 2 suitable for pumping liquids from an axial direction to a radial direction, as indicated by arrows 3. These liquids are sucked in by at least one inlet conduit 4 and pumped towards a manifold 5, generally having a substantially cylindrical shape, which is arranged around impeller 1 and is provided with one or more delivery conduits 6 for the liquids pumped by impeller 1.

[0007] Figure 2 shows the blades of blading 2 (drawn with partially broken lines) which are suitably oriented to pump liquids towards manifold 5 in the direction of arrows 3 according to the rotation direction (clockwise in the figure) of impeller 1.

[0008] Referring also to figure 3, it is visible that impeller 1 is mechanically linked to a shaft 7 which can be driven by a motor 8 through a mechanism comprising a screw 9 which is fixed to shaft 7 and is rotatably arranged inside a cylindrical hub 10 joined to impeller 1, in particular integral thereto. Motor 8 is provided with control means, for example of the electronic kind, suitable for controlling the rotation direction of shaft 7. The cylindrical hub 10 is suitably provided with an inner protrusion 11 suitable for sliding along the helicoidal canal 12 of screw 9, so that the rotation of shaft 7 in one direction or in the other causes the advancing or the moving back, respectively, of impeller 1 in a housing 13 having a substantially cylindrical shape obtained in the body of the pump. The axial movement of impeller 1 with respect to shaft 7 is limited by a pair of cylindrical shoulders 14 which are arranged at the two ends of screw 9 and stop the sliding of the internal protrusion 11 along the helicoidal canal 12.

[0009] According to the invention, impeller 1 is provided with a second blading 15 which is oriented in the opposite direction with respect to the direction of the first blading 2, is arranged in a substantially coaxial way with the latter and is divided therefrom by a cover disk 16. The selection of blading 2 or 15 with the orientation suitable for pumping the liquids coming from the inlet conduit 4 toward manifold 5 is automatically accomplished by the pump according to the rotation direction of shaft 7, since the rotation thereof in one direction or in another one causes the axial moving of impeller 1 in housing 13 and the consequent arrangement of blading 2 or 15 suitable for pumping according to the rotation direction of shaft 7 close to a first cylindrical opening 17 or a second cylindrical opening 18, respectively, which connect housing 13 of impeller 1 with manifold 5. Manifold 5 is suitably provided with a dividing wall 19 arranged between the cylindrical openings 17, 18 to divide manifold 5 into two separate chambers, the first chamber being connected to the first delivery conduit 6 and the second chamber being connected to a second delivery conduit 20. The height of openings 17, 18 which link the housing 13 of impeller 1 to manifold 5 is substantially equal to the height of the first blading 2 and/or the second blading 15.

[0010] Referring now to figures 4 and 5, it is visible that the inversion of the rotation direction of shaft 7 causes the sliding of the internal protrusion 11 of hub 10 along screw 9 and thus the axial moving of impeller 1 toward motor 8. This causes the arrangement of the sec-

ond blading 15 (drawn with broken lines in figure 5) close to the second opening 18 and the simultaneous arrangement of the first blading 2 close to the inner wall of housing 13 comprised between openings 17 and 18, so as to make the latter blading inactive. Therefore, the flow of the liquids coming from the inlet conduit 4 and pumped by the second blading 15 towards manifold 5 follows the direction (counterclockwise in figure 5) indicated by arrows 21 and induced by this blading, so as to pump liquids toward the delivery conduit 20 and not toward the delivery conduit 6. A further inversion of the rotation direction of shaft 7 would cause another axial moving of impeller 1, which would be arranged again as in figures 1 to 3.

[0011] In other embodiments of the present invention the screw mechanism which connects the shaft to the impeller may be modified. For example, shoulders 14 may limit the sliding of hub 10 and not of protrusion 11 into the helicoidal canal 12 or the latter may be obtained in the inner wall of hub 10, so as to be a female screw 9 integral therewith, while protrusion 11 is rigidly connected to shaft 7.

Claims

1. A centrifugal pump comprising an impeller (1) provided with a first blading (2) suitable for sucking liquids from at least one inlet conduit (4) and pumping them towards a manifold (5) arranged around the impeller (1), the blades of this first blading (2) being oriented for pumping according to a rotation direction (3) of the impeller (1), which is mechanically linked to a shaft (7) which can be driven by a motor (8), **characterized in that** the impeller (1) is provided with a second blading (15) oriented in the direction opposite to the direction of the first blading (2) and is linked to the shaft (7) by means of a screw mechanism (9, 11, 12) so that the rotation of the shaft (7) in one direction (3) or in the other one (21) causes the axial advancing or moving back, respectively, of the impeller (1) in a housing (13) obtained in the body of the pump and the consequent arrangement of the blading (2, 15) suitable for pumping according to the rotation direction (3, 21) of the shaft (7) close to at least one first (17) or at least one second (18) opening which connect the housing (13) of the impeller (1) to the manifold (5).

2. A pump according to the previous claim, **characterized in that** said screw mechanism (9, 11, 12) comprises a screw (9) which is fixed to the shaft (7) and is rotatably arranged inside a hub (10) which is joined to the impeller (1) and is provided with a protrusion (11) suitable for sliding along the helicoidal canal (12) of the screw (9).

3. A pump according to claim 1, **characterized in that** said screw mechanism (9, 11, 12) comprises a protrusion (11), which is rigidly linked to the shaft (7) and is suitable for sliding along a helicoidal canal (12) obtained in the internal wall of a hub (10) joined to the impeller (1), so as to form a female screw (9) integral with this hub (10).

4. A pump according to one of the previous claims, **characterized in that** the axial moving of the impeller (1) with respect to the shaft (7) is limited by a pair of shoulders (14) which are arranged at the two ends of the screw mechanism (9, 11, 12).

5. A pump according to claim 4, **characterized in that** said shoulders (14) stop the sliding of the protrusion (11) along the helicoidal canal (12).

6. A pump according to claim 4, **characterized in that** said shoulders (14) stop the axial sliding of the hub (10) of the impeller (1).

7. A pump according to one of the previous claims, **characterized in that** the second blading (15) is arranged substantially coaxial to the first blading (2).

8. A pump according to one of the previous claims **characterized in that** the first (2) and the second blading (15) are divided by a cover disk (16).

9. A pump according to one of the previous claims, **characterized in that** the height of the openings (17, 18) which link the housing (13) of the impeller (1) to the manifold (5) is substantially equal to the height of the first (2) and/or of the second (15) blading.

10. A pump according to one of the previous claims, **characterized in that** a dividing wall (19) arranged between the openings (17, 18) of manifold (5) divides the latter into two separate chambers, the first chamber being connected to a first delivery conduit (6) and the second chamber being connected to a second delivery conduit (20).

11. A pump according to one of the previous claims, **characterized in that** when the first (2) or the second (15) blading are arranged close to the first (17) or at the second (18) opening, the second (15) or the first (2) blading are respectively arranged close to the internal wall of the housing (13) comprised between the two openings (17, 18).

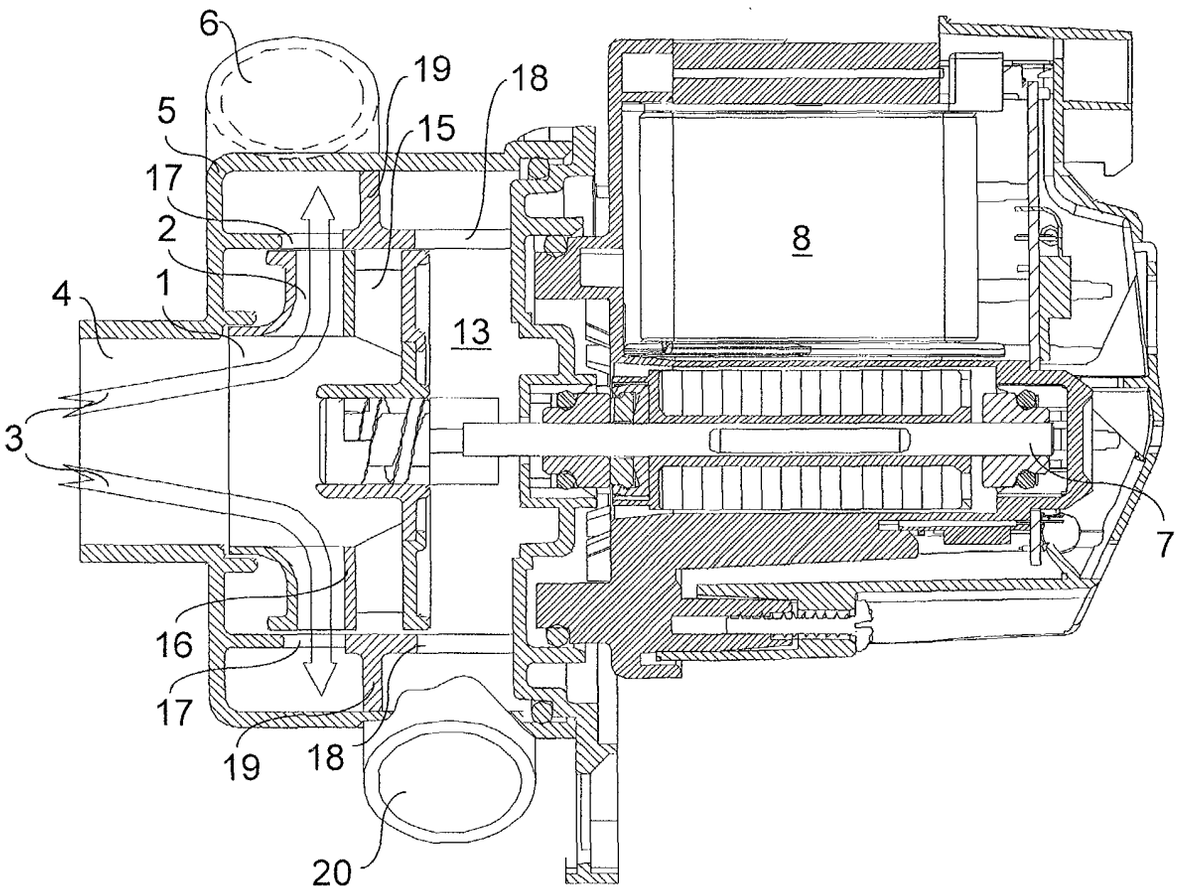

Fig.1

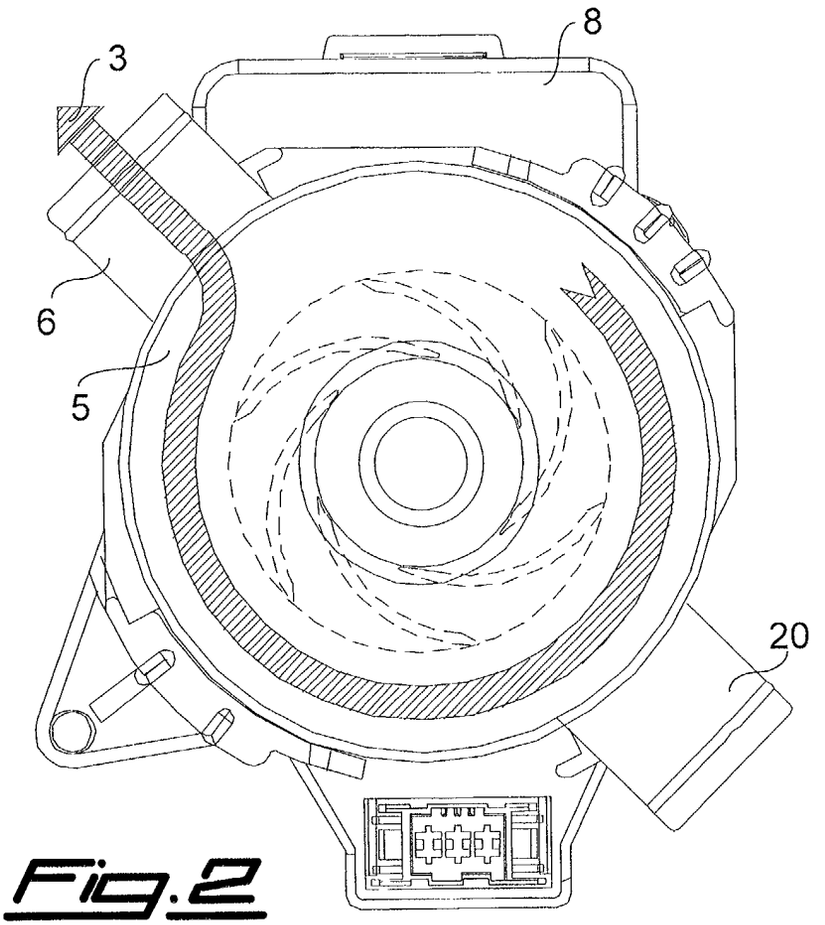

Fig.2

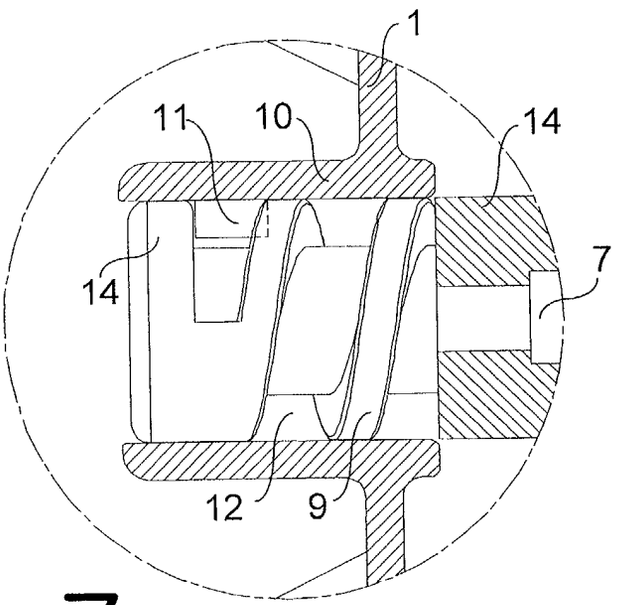

Fig.3

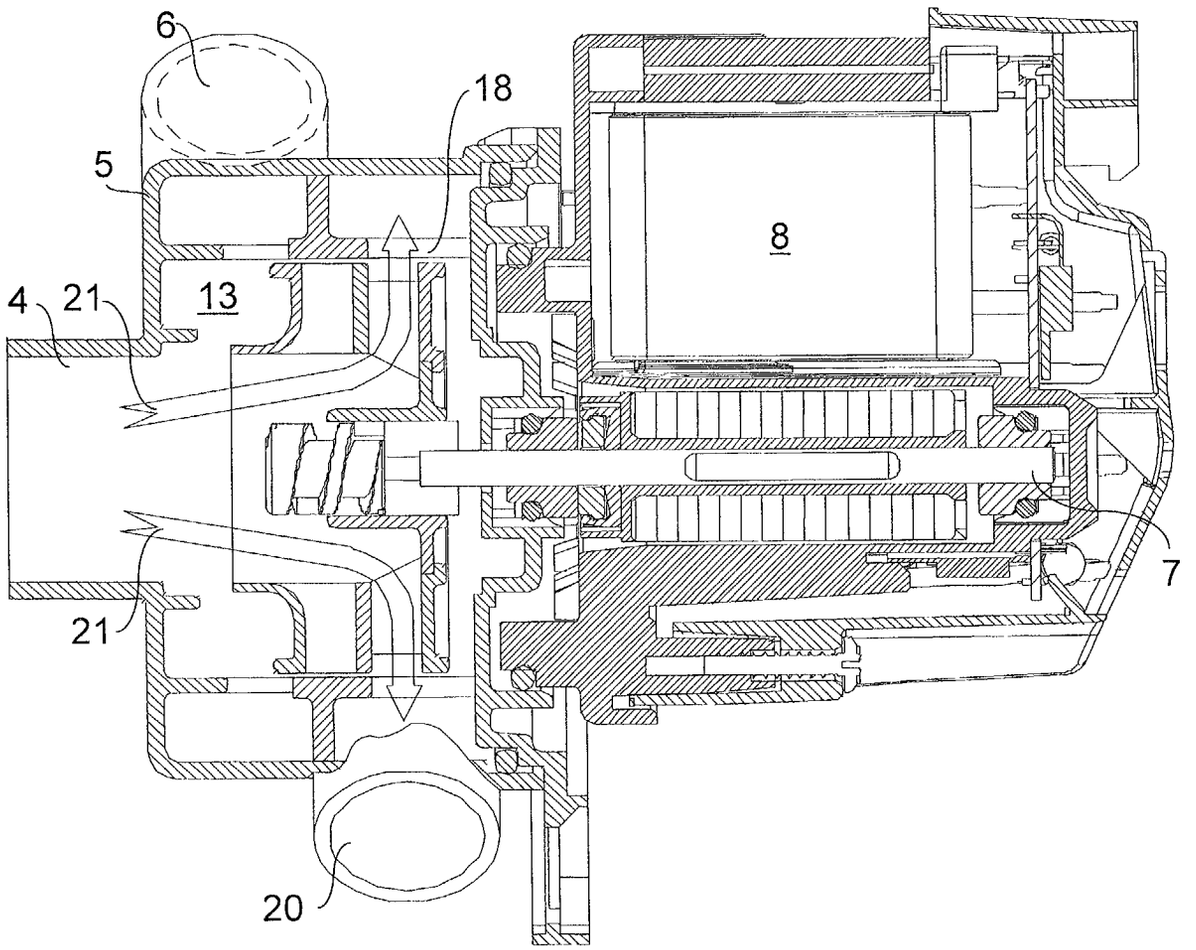

Fig.4

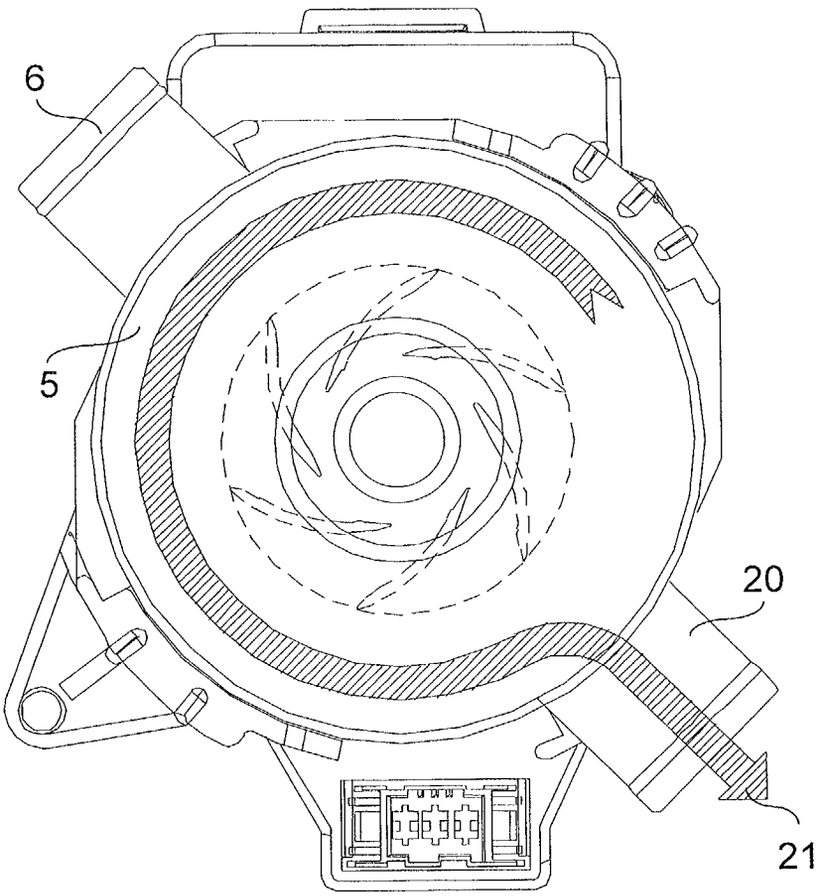

Fig.5

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EUROPEAN SEARCH REPORT

Application Number
EP 02 42 5649

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	GB 1 398 148 A (ESSWEIN SA) 18 June 1975 (1975-06-18) * column 2, line 41 - line 71 * * column 3, line 25 - line 42 * * figures 2,3 *	1	F04D13/14 F04D29/22
A	US 4 941 801 A (TAKAKURA YOSHINARI) 17 July 1990 (1990-07-17) * column 1, line 51 - line 55 * * column 2, line 9 - line 26 * * figure 1 *	1	
A	US 2 916 997 A (FRANCOIS TERRIE PAUL) 15 December 1959 (1959-12-15) * the whole document *	1	
A	EP 0 465 787 A (ZANUSSI ELETTRODOMESTICI) 15 January 1992 (1992-01-15) * the whole document *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7) F04D A47L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	28 August 2003	Giorgini, G

CATEGORY OF CITED DOCUMENTS

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